Multisensor system based on electrochemical microsensors and data fusion for classifying grape juices

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A multisensor system combined with multivariate analysis was applied for the characterization and classification of white grape juices. The proposed system, known as hybrid electronic tongue, consisted of an array of electrochemical microsensors - seven ISFET potentiometric sensors sensitive to pH and common ions (Na^+, K^+, Ca^{2+}, Cl^- and NO_3^-), a conductivity sensor, a redox potential sensor, an amperometric gold microelectrode and a microelectrode for sensing electrochemical oxygen demand - and a colorimetric optofluidic system. The microsensors were fabricated with microelectronics technology and the optofluidic system with soft lithography techniques. The data obtained with all these sensors were treated with Principal Component Analysis (PCA) and Soft Independent Modeling Class Analogy (SIMCA). For testing the system, a set of 25 white grape juices representing the large variability of vines grown in the North-west Iberian Peninsula were studied. PCA was used to train the system with the reference genotypes of these vines -*Albariño, Muscat à Petit Grains Blanc* and *Palomino*- and SIMCA to study the feasibility to distinguish between different grape juice varieties. The results show that this system differentiates with a high resolution the three reference varieties (Figure 1). Also the PCA model constructed allows obtaining rapid and global information about their basic characteristics: aromatic quality, total acidity, pH, global content of sugars, colour intensity, etc. Besides, SIMCA technique allows distinguishing between the reference varieties and the rest of grape juice samples. With a 95 % of probability, no grape juice confuses with the *Albariño* or *Muscat à Petit Grains Blanc* models (Figure 2).

This system could be applied for fraud detection and it could also be a very useful tool for the producers during wine-making according to the grape juice characteristics reported.

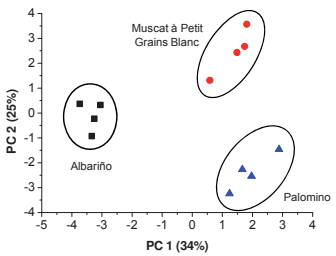

Fig. 1. Constructed PCA model

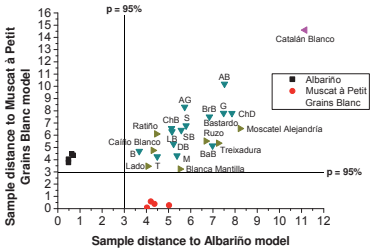

Fig. 2. Obtained SIMCA diagram

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